equipment, the instruction, and the research, and the service, in accordance with the best ideals of modern medical education—as an essential unit of our university plan for development.

Professor W. H. Dalrymple has resigned the editorship of the *Journal* of the American Veterinary Association because of his appointment to the deanship of the college of agriculture of the Louisiana State University. The nominees for the governorship and the legislature have pledged themselves the support of the movement for a greater university, in which movement it is proposed to raise three million dollars for the college of agriculture.

Dr. Allen E. Stern, of the department of chemistry at the University of Illinois, took charge of the division of physical chemistry at the University of West Virginia, beginning in February.

Dr. Henry C. Tracy, of the Marquette Medical School, has been appointed professor of anatomy at the University of Kansas.

Dr. C. H. Edmundson, professor of zoology at the University of Oregon, resigned at the close of the fall term to accept the position as head of the department of zoology and director of the research laboratories at the College of Hawaii, Honolulu.

Professor Clarence Moore has resigned the chair of biology in Dalhousie University, Halifax, N. S., and has been succeeded by Professor Dowell Young, of Cornell University.

DISCUSSION AND CORRESPONDENCE

UNRELIABLE EXPERIMENTAL METHODS OF DETERMINING THE TOXICITY OF ALKALI SALTS

A method frequently used by investigators of the toxicity of alkali salts is to add certain percentages of salts to soils, plant them to crops and estimate the toxicity by the depression of the crop growth. They assume that if sodium carbonate or other salt is added to a pot of soil, that it remains in solution in the soil and that its toxicity can be measured by subsequent crop growth. Very elaborate and expensive experiments have been performed based upon this assumption.

Now it has been shown by various investigators that soils absorb a part, at least, of the salts added, and that the crop growth in these treated soils is much more closely related to the proportion of alkali salts recoverable from the soils than to the proportion of salts which have been added. In other words, the toxicity of salts is not so accurately measured by the amount added to the soil as by the salts recoverable by analysis after the treatments have been made.

Two papers have been published in the *Journal of Agricultural Research* which illustrate the erroneous conclusions that may be reached when toxicity is determined by the per cent. of salts added, viz., "Effect of alkali salts in soils on the germination and growth of crops," by Frank S. Harris, and "Soil factors affecting the toxicity of alkali," by F. S. Harris and D. W. Pittman. In both these investigations the attempt was made to measure the toxicity by correlating crop growth with the amount of salts added. In the first-named paper Mr. Harris reaches the following conclusions which are not in accordance with results obtained by other investigators. The questionable results quoted below would almost certainly not have been secured had the more accurate method been followed of measuring toxicity by correlating crop growth with the soluble salts found in the soil after the various additions had been made.

The conclusions which appear to the writer to be unjustified are:

1. "Only about half as much alkali is required to prohibit the growth of crops in sand as in loam."

Since no analyses were made Mr. Harris did not know how much alkali was contained in the soil solution in either sand or loam and the conclusion is therefore unjustifiable.

2. "Results obtained in solution cultures for the toxicity of alkali salts do not always hold when salts are applied to the soil."

This statement may be true but his experiments do not warrant the drawing of such a conclusion for here again the author did not determine the concentrations of the soil solutions and he therefore has no basis for comparing the toxicity of salts in solution cul-

tures with the same concentrations in soil solutions.

3. "The toxicity of soluble salts in the soil was found to be in the following order: sodium chlorid, calcium chlorid, potassium chlorid, sodium nitrate, magnesium chlorid, potassium nitrate, magnesium nitrate, sodium carbonate, potassium carbonate, sodium sulfate, potassium sulfate, and magnesium sulfate."

Since the author did not determine and did not know how much of these salts were actually in the soil solution he could not very well indicate their relative toxicities. It will be noted that sodium carbonate is placed near the bottom of the list as a relatively harmless salt, whereas, as a matter of fact, it is one of the most toxic salts occurring in the alkali soils of the west.

4. "Land containing more than the following percentages of soluble salts are probably not suited without reclamation to produce ordinary crops: In loam, chlorids 0.3 per cent.; nitrates, 0.4 per cent.; carbonates, 0.5 per cent.; sulfates, above 1.0 per cent. In coarse sands, chlorids, 0.2 per cent.; nitrates, 0.3 per cent; carbonates, 0.3 per cent. and sulfates, 0.6 per cent."

Here again the author draws conclusions without having accurate data on which to base them. If the above percentages were to be adopted by chemists in determining the suitability of alkali soils in the field for crop growth, the results would be misleading in the extreme. The results are not in accord with those obtained by determining toxic limits in field studies, nor with laboratory experiments in which toxicity is related to the alkali actually in the soil solution instead of to that which was put in.

In the paper by Harris and Pittman, published in November, 1918, the authors have adopted the same erroneous method but they are more careful in drawing conclusions as the absorption of the salts added is apparently recognized but is not determined and related to crop growth. The conclusion, however, that "Loam soils and soils with a high water-holding capacity may be successfully farmed at a higher alkali content than others" may possibly be true but there is no data given in the paper which justifies the conclusion, for the per cent, of alkali salts recoverable from the two kinds of soil was not correlated with crop growth.

It is also suggested that the results obtained by Brown and Hitchcock published under the title "The effects of alkali salts on nitrification" (*Soil Science,* Vol. IV., No. 3) and by Singh on the "Toxicity of alkali salts" (*Soil Science,* Vol. IV., No. 6) would have been more valuable had they been correlated with the recoverable salts rather than with the salts added to the soils with which they were working.

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ON HIGH-ALTITUDE RESEARCH

I AM beginning to appreciate the difficulty of making one's self understood in a statement where matters are suggested rather than explained in detail, and where a critical attitude is urged until a result is actually verified by experiment, even when one feels perfectly confident beforehand what the result will be. The present statement is written for the purpose of correcting any misconceptions that may have arisen from my recent press statement.

First, the time necessary for a preliminary exploration of the atmosphere will be required chiefly for the preparation. It is not like an exploration of "darkest Africa," for, with the proper rocket apparatus and instruments, each flight will occupy but a short time; and not many will be needed to obtain a very considerable amount of information, such as an accurate knowledge of densities, that would be needed for any further developments.

The expense also will be chiefly that for preparation; namely, for machine construction and tests. A final form of apparatus, designed for reaching any particular altitude, should not be expensive. This is, of course, true of any product that requires machine development.